IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS

In re application of:

Christopher H. Bajorek

Examiner: Matthew J. Daniels

Art Unit: 1791

Application No: 10/659,006

Filed: September 9, 2009

For: ISOTHERMAL IMPRINTING

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APPEAL BRIEF
IN SUPPORT OF APPELLANT'S APPEAL
TO THE BOARD OF PATENT APPEALS

Pursuant to 37 C.F.R. § 41.37, Appellant hereby submits this Appeal Brief in support of an appeal from a decision of a Final Office Action mailed January 22, 2009, for the above-referenced case. Appellant respectfully requests consideration of the accompanying Appeal by the Board of Patent Appeals for allowance of the above captioned patent application as presently recited in the claims.

An oral hearing is not requested.

EFS FILED: APRIL 20, 2009

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I. REAL PARTY IN INTEREST

The real party in interest of the above-referenced U.S. Patent application is WD Media Inc., 1710 Automation Parkway, San Jose, California 95131, to whom the application has been assigned.

II. RELATED APPEALS AND INTERFERENCES

To the best of Appellant's knowledge, there are no prior or pending appeals, interferences, or judicial proceedings related to the subject matter of this appeal that will directly affect, be directly affected by, or have a bearing on the Board's decision in the pending appeal.

III. STATUS OF CLAIMS

Claims 1-16, 18, 19 and 22-25 are currently pending in the above-referenced application. A copy of these claims is provided in the claims appendix. Claims 17, 20 and 21 have been canceled.

Claims 1-16, 18, 19 and 22-25 were finally rejected in the Final Office Action mailed January 22, 2009. These claims are now the subject of this Appeal.

IV. STATUS OF AMENDMENTS

No amendments are currently pending.

This Brief is submitted in response to the Final Office Action mailed January 22, 2009.

V. SUMMARY OF CLAIMED SUBJECT MATTER

In the summary below, the referenced portion of the Specification should be construed as only representative of the teachings that support the claimed feature(s). Thus, the cited portions are sufficient to support the claim, but are not necessarily the exclusive support in the Specification for such claim features.

Embodiments of the claimed subject matter relate to nano-imprint lithography (NIL) to form raised and recessed zones of a magnetic discrete track recording (DTR) disk. (p. 3, lines 9-11). Generally, a NIL method imprints a mold into a polymer resist film on a disk substrate. During the imprint step, both the mold and the resist coated disk are heated and the heated mold and disk are compressed together. Conventionally, the mold is then separated from the disk after being first cooled down to room temperature to result in a pattern of the raised and recessed zones in the resist film. (p. 3, lines 11-15).

However, Appellant found the cooling of the coupled mold/disk to room temperature prior to their separation may result in problems such as difficulty in the separation and damage to the resulting imprinted pattern in the resist film. (p. 3, lines 16-18). Appellant determined these problems to be attributable to the mold having a different coefficient of thermal expansion than that of the resist film coated disk substrate and that the difference can cause strain or relative motion between the mold and work piece that exceeds the dimensions sought by the NIL process. (p. 3, line 19 - p. 4, line 4).

Claim 1 recites a nano-imprint lithography method where a flat stamper (p. 13, lines 2-3; Fig. 1B(90)) and a resist film (p. 13, line 1; Fig. 1A(30)) is heated (p. 22, line 13; Fig. 8A(830)). The heated stamper is then imprinted into the resist film (p. 13, lines 2-6); Fig. 1B(90)). The stamper is separated from the resist film before the resist film is cooled below approximately a glass transition temperature of the resist film (p. 13, lines 7-8; Fig. 1B; p. 22, lines 18-20; Fig. 8A(840 and 843)) and the resist film is cooled below the glass transition temperature after the separating (p. 13, lines 7-8; Fig. 1B; p. 22, lines 14-20; Fig. 8A(840 and 843)).

Claim 25 further recites the method of claim 1 where imprinting the stamper into the resist film comprises imprinting the stamper into the resist film to simultaneously produce a pattern of trench areas and plateau areas over an area of the resist film approximately equal the surface area of the stamper (p. 13, lines 2-3; Fig. 1B (90)).

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

CLAIM REJECTIONS UNDER 35 U.S.C. § 102

A. Claims 1, 2, 8 and 25 were rejected under 35 U.S.C § 102(b) as being anticipated by Krauss (Ph.D. Dissertation, entitled *Nanostructure Engineering: Quantized Magnetic Disk and Nanoimprint Lithography*, hereinafter "Krauss").

B. Claims 1-4, 8, 11, 14, 15, 18 and 25 were rejected under 35 U.S.C. § 102(b) as being anticipated by Tan, *Roller nanoimprint lithography* (J.Vac. Sci. Technol. B 16 (6), hereinafter "Tan").

CLAIM REJECTIONS UNDER 35 U.S.C. § 103

A. Claims 1-4, 8, 11, 14, 15, 18 and 25 were alternatively rejected under 35 U.S.C. §103(a) as obvious over Tan.

B. Claims 1, 2, 8, 11, 12, 18, 22 and 25 were rejected under 35 U.S.C §103(a) as obvious over Davis.

C. Dependent Claim Rejections

1) Claims 3, 4, 10, 11, 12 and 13 were rejected under 35 U.S.C. §103(a) as obvious over Krauss.
2) Claims 5 and 6 were rejected under 35 U.S.C. §103(a) as obvious over Tan, in view of US Patent No. 5,956,216 issued to Chou (hereinafter "Chou'216").
3) Claim 7 was rejected under 35 U.S.C. §103(a) as being unpatentable over Tan in view of Chou'216, further in view of US Patent No. 6,309,580 issued to Chou (hereinafter "Chou'580").
4) Claims 10, 12, 13 and 16 were rejected under 35 U.S.C. §103(a) as obvious over Tan.
5) Claim 9 was rejected under 35 U.S.C. §103(a) as obvious over Tan, in view of Heidari, *Nanoimprint lithography at the 6 in. wafer scale* (J. Vac. Sci. Technol. B 18(6) Nov/Dec 2000, hereinafter "Heidari").
6) Claim 19 was rejected under 35 U.S.C. §103(a) as obvious over Tan, in view of Schneider, *Lorentz microscopy of circular ferromagnetic permalloy nanodisks*

(Applied Physics Letters, 77(18) Oct 2000, hereinafter "Schneider").

7) Claim 22 was rejected under 35 U.S.C. §103(a) as obvious over Tan in view of US Publication No. 2002/0025408 issued to Davis (hereinafter "Davis").
8) Claim 23 was rejected under 35 U.S.C. §103(a) as being unpatentable over Tan in view of Chou'216 and Chou'580, further in view of US Patent No. 4,786,564 to Chen (hereinafter "Chen").
9) Claim 24 was rejected under 35 U.S.C. §103(a) as being unpatentable over Tan in view of Chou'216, Chou'580 and Chen, further in view of Davis.
10) Claims 3-6 and 19 were rejected under 35 U.S.C. §103(a) as being unpatentable over Davis in view of Chou'216.
11) Claim 7 was rejected under 35 U.S.C. §103(a) as being unpatentable over Davis in view of Chou'216, further in view of Chou'580.
12) Claims 9 and 18 were rejected under 35 U.S.C. §103(a) as being unpatentable over Davis in view of Colburn, *Development and advantages of step-and-flash lithography* (Solid State Technology, 44(7) July 2001).
13) Claims 10 and 13-16 were rejected under 35 U.S.C. §103(a) as being unpatentable over Davis.
14) Claims 23 and 24 were rejected under 35 U.S.C. §103(a) as being unpatentable over Davis in view of Chou'216, Chou'580 and Chen.

CLAIM REJECTIONS UNDER 35 U.S.C. § 112

A. Claim 25 was rejected under 35 U.S.C § 112, first paragraph, as being based on a disclosure which is not enabling.

VII. ARGUMENT

CLAIM REJECTIONS UNDER 35 U.S.C. § 102

A. Claims 1, 2, 8 and 25 are Not Anticipated by Krauss

Page 4 of the Final Office Action mailed January 22, 2009 maintains claim 1 to be anticipated by Krauss pp. 82-84. In particular, the final rejection cites p. 83, lines 10-12 as disclosing "separating the stamper from the resist film before the resist film is cooled below approximately a glass transition temperature of the resist film," as recited in claim 1.

Appellant submits Krauss fails to anticipate claim 1 because it is Krauss, p. 83, lines 8-10, not lines 10-12, which disclose the conditions pertaining to the resist temperature during separation of the mold for Krauss' method that begins on p. 82. Specifically, Krauss' method describes sequential operations where, "both the mold and the substrate with PMMA film were first heated to … above the glass transition temperature of MPPA" (p. 82, lines 17-21) … "next, the mold was pressed against the resist (p. 83, lines 5-6) … "following the compression molding, the mold and wafer were kept under pressure while the platens cooled, until the temperature dropped below the PMMA's glass-transition temperature." (Krauss, p. 83 lines 8-10, emphasis added). Krauss' method concludes with this last quoted statement. Appellant therefore submits the method Krauss discloses on p. 82, line 17 – p. 83 line 10 is completely disclosed as of p. 83 line 10 and as such clearly fails to anticipate Appellant's claimed method.

Appellant further submits the rejection improperly relies on Krauss, p. 83, lines 10-12 because this portion of Krauss explicitly describes what Krauss **did not do** after first heating both the mold and the resist as described on p. 82, lines 17-21 and next imprinting the resist with the mold as described on p. 83 lines 5-6.

The Final Office Action p. 18 asserts, "Krauss did perform the process described on p. 83 of the reference at lines 10-12 since the reference set forth particular results in terms which are not speculative." Appellant believes the Examiner's inference the Krauss must have performed the presently claimed method is improper because Krauss' statement "resulted in the PMMA flowing" on p. 83, line 12 is described by Krauss distinct from the portions of the method disclosed in Krauss p. 82 line 17- p. 83, line 10 upon which the rejection relies for other elements of Appellant claim. Therefore, Krauss in p. 83, lines 10-12 is properly interpreted as a sidebar comment where

the method operations other than "separation before the PMMA had cooled below its glass transition" are undisclosed. For example, it is not clear that both the mold and the PMMA coated wafer where heated in the method that "resulted in the PMMA flowing."

Thus, Appellant is of the position that the rejection improperly takes portions of Krauss' disclosure which clearly relate to multiple experiments and different conditions and stitches them together to arrive at a conclusion that Krauss discloses Appellant claimed method.

For at least these reasons, Appellant requests the Board to reverse the 35 U.S.C. §102(b) rejection of claim 1 based on Krauss. Appellant further requests the Board to reverse the rejection of claims 2, 8 and 25, as claims dependent upon claim 1.

B. Claims 1-4, 8, 11, 14, 15, 18 and 25 are Not Anticipated by Tan

1. Claim 1 is not anticipated by Tan because Tan fails to disclose a "Stamper that is flat."

Claim 1 recites "the stamper is flat." As such, one of ordinary skill in the art would understand claim 1 to specify a stamper distinct from a stamper bent into a cylinder, as disclosed in Tan's methods, utilizing either a "cylinder mold" (p. 3926, Sec. III para. 1) or a cylindrical roller to cause a "deformation," in a mold (p. 3926, Sec. III para. 2).

The Final Office Action asserts on page 4 asserts, "the stamper is locally flat in the region which is being imprinted. A compact disk is sufficiently large that even when the Tan disk mold (Fig. 3) is formed in a roll, there would be no detectable curvature over the surface as shown in Fig. 3 of Tan."

Appellant submits such an assertion flies in the face of the ordinary and plain meaning of a "flat" stamper as would be understood by one of ordinary skill in the art because the transverse cross-section of Tan's cylinder, no matter what the radius, is not "flat" anywhere. Appellant further submits it is immaterial whether or not such curvature is "detectable" *per se* because detectability speaks only to the method of detection and not to state of the stamper. The inappropriateness of the Examiner's interpretation of "flat" is further evident in the rejection's reliance on the phrase "locally flat," which Appellant submits is concept wholly undefined in Tan and the instant application and at best ambiguous in the art. Nonetheless, Appellant fails to see any way that Tan's methods could even provide for a "locally flat" stamper when Tan explicitly discloses deforming stamper such that it is not flat (whether or not globally or locally).

Furthermore, Tan in reference to the two roller methods Tan describes, "only the area in contact with the roller has a temperature higher than T_g, making the resist in that area flow and being imprinted with patters. This is different from flat nanoimprint, where the entire resist, heated above T_g, is imprinted … until the resist is cooled down, becoming hardened." (Tan, p. 3926, §III, ¶3) Thus, Appellant submits the interpretation that Tan's stamper is "flat" is contrary to the distinction the Tan reference itself describes.

Appellant therefore submits the rejection improperly relies on an interpretation that is contrary to a claim term's plain meaning and the reference's own teaching. Appellant further submits the rejection improperly relies on undefined ambiguous concepts such as "locally flat," and "detectable curvature."

2. Claim 1 is not anticipated by Tan because Tan fails to inherently anticipate "separating the stamper from the resist film before the resist film is cooled below approximately a glass transition temperature of the resist film."

The Final Office Action asserts it would be inherent in Tan's methods that "the resist in contact with the stamper would still be at a temperature above its glass transition temperature when the stamper separates from the resist. Appellant disagrees because Tan's method is disclosed to include a platform temperature which is described to be around 50 °C while the roller is at 170-200 °C (Tan, p. 3927, col. 2, para. 1). Thus, because the roller will lose heat to the resist and platform at a rate dependent on the lamp power and roller scan or rotation rate, Appellant submits the temperature of the resist at separation may be anywhere between the platform and roller temperature.

For at least these reasons, Appellant requests the Board to reverse the 35 U.S.C. §102(b) rejection of claim 1 based on Tan. Appellant further requests the Board to reverse the rejection of claims 2-4, 8, 11, 14, 15, 18 and 25 as claims dependent upon claim 1.

3. Claim 25 is not anticipated by Tan because Tan distinguishes the roller methods from the flat stamper method recited in claim 2

Claim 25 recites "imprinting the stamper into the resist film to simultaneously produce a pattern of trench areas and plateau areas over an area of the resist film approximately equal the surface area of the stamper." While Appellant notes the Final Rejection provides no specific basis for the rejection of claim 25, Appellant submits the rejection is factually unsupportable because

Tan specifically states in reference to the roller methods cited in the rejection, "this is different from flat nanoimprint, where the entire resist, heated above T_g, is imprinted simultaneously and the pressure is applied until the resist is cooled down, becoming hardened." (Tan, p. 3926, §III, ¶3, *emphasis added*).

For this additional reason that Tan specifically distinguishes the roller methods from the flat stamper method recited in claim 25, Appellant requests the Board to reverse the rejection of claim 25.

CLAIM REJECTIONS UNDER 35 U.S.C. § 103

A. Claims 1-4, 8, 11, 14, 15, 18 and 25 are Not Obvious in View of Tan

1. Claim 1 is not obvious in view of Tan because Tan's apparatus-specific disclosure fails to ender the presently claimed method a mere optimization of a "result effective variable."

Appellant disagrees with the contention made on p. 5 of the Final Office Action that separating a substantially flat stamper from a resist film "before the resist film is cooled below approximately a glass transition temperature of the resist film" is obvious in view of Tan's teaching to optimize the temperature of both components … within a wide temperature range."

Appellant first notes Tan states the roller methods to which the ranges cited by the rejection pertain are "different from flat nonoimprint, where the entire resist, heated above T_g, is imprinted simultaneously and the pressure is applied until the resist is cooled down" because in Tan's roller methods "only the area in contact with the roller has a temperature higher than T_g." (p. 3926, Sec. III, ¶ 3). Tan therefore implicitly teaches away from a merely separating a flat stamper from a resist film at a temperature within Tan's temperature range by calling out the temperature differences between the flat stamper and roller methods as a fundamental point of distinction between the two methods.

Appellant further submits the substantial differences between the apparatus employed by Tan's method and those known in the art for imprinting with the presently claimed "flat stamper" preclude Tan's apparatus-specific disclosure from rendering the presently claimed method a mere optimization of a "result effective variable." Tan describes ranges of roller scan speed and pressures along with a range of platform and roller temperatures (p. 3927, right col.). These ranges provided by Tan are therefore unique to Tan's apparatus as depicted in Tan Fig. 1 and have little to

do with flat stamper apparatuses known in the art. For this reason, Appellant submits one of ordinary skill would consider the differences between flat stamping and Tan's roller stamping make it unlikely that Tan's temperature ranges for the roller and platform could merely be optimized when applied in a flat stamping apparatus.

Furthermore, a "result-effective variable" is narrowly interpreted to be only that which "achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation." *In re Antonie*, 559 F.2d 618, 195 USPQ 6 (CCPA 1977) (emphasis added). Appellant submits Tan's recognized result is not merely "conformance of the resist to the pattern of Tan," as asserted on p. 18 of the Final Office Action, but rather "conformance of the resist to the pattern of Tan using the roller method of Tan." As such, Appellant submits one of ordinary skill in the art seeking to perform a method with a flat stamper would lack any basis to arrive at separating that stamper from the resist film "before the resist film is cooled below approximately a glass transition temperature of the resist film" merely by way of optimizing the ranges provided for Tan's roller apparatus.

For at least these reasons, Appellant requests the Board to reverse the 35 U.S.C. §103(a) rejection of claim 1 based on Tan. Appellant further requests the Board to reverse the rejection of claims 2-4, 8, 11, 14, 15, 18 and 25 as claims dependent upon claim 1.

2. Claim 25 is not Obvious in View of Tan

Appellant submits the substantial differences between the apparatus employed by Tan's method and the "simultaneous" imprinting recited in claim 25 preclude Tan's apparatus-specific disclosure from rendering the presently claimed method a mere optimization of a "result effective variable."

Appellant again notes Tan states the roller methods to which the ranges cited by the rejection pertain are "different from flat nonoimprint, where the entire resist, heated above T_g, is imprinted simultaneously and the pressure is applied until the resist is cooled down" because in Tan's roller methods "only the area in contact with the roller has a temperature higher than T_g." (p. 3926, Sec. III, ¶ 3). Tan therefore implicitly teaches away from merely separating a flat stamper from a resist film at a temperature within Tan's ranges by calling out the temperature differences between flat stamping and roller imprinting as a fundamental point of distinction between a method which simultaneously imprints a large area of the resist film a method which imprints a small area of a resist film at a time. For at least this additional reason, Appellant requests the Board to reverse

the 35 U.S.C. §103(a) rejection of claim 25 based on Tan.

B. Claims 1, 2, 8, 11, 12, 18, 22 and 25 are Not Obvious not obvious in view of Davis

1) Prima Facie Case of Obviousness is Factually Unsupported

The Final Office Action pp. 12 asserts claim 1 is obvious over Davis. The rejection first cites Davis' statement that a mold temperature, "can be at, above, or below the glass transition (Tg) temperature" (Davis ¶ [0073]). Appellant notes these three states merely recite the only three conditions physically possible and therefore this statement alone provides no specific guidance whatsoever to one of ordinary skill in the art. Notably, preheating the mold to a temperature below the glass transition temperature is the most preferred method of the specific methods Davis discloses immediately following the generic introductory statement. (Davis ¶ [0073]). Appellant submits the Final Office Action mischaracterizes Davis to state 10 °C is "most preferred."

The rejection further cites from Davis, "once the substrate has attained the desired temperature, it is placed in the mold and pressure is applied. After placing the substrate in the mold the temperature thereof can be maintained, increased or decreased as necessary to optimize replication and enable substrate release." (Davis ¶ [0075]). Here again however, Appellant notes Davis' merely describes controlling the mold temperature "as necessary" in any one of the only three physically possible ways to control a temperature (e.g., increase it, decrease it or maintain it). Thus, the conditions are the three generic alternatives and they are also not specifically stated to be done during removal of the substrate from the mold.

Appellant submits the only recitation in Davis paragraph [0075] that would be at all insightful to one of ordinary skill is the description that "typically in order to maintain the integrity of the surface features, the molded substrate is cooled to below the glass transition temperature prior to removal from the mold." (*emphasis added*). One of ordinary skill would therefore understand Davis' only guideline with respect to temperature at the time of removal is to have the substrate below Tg. Of course, depending on where the mold temperature is first heated (e.g., within 30 °C above Tg, below Tg, etc. as described in Davis ¶ [0073]), one might either need to decrease, increase or maintain the mold temperature, (Davis ¶ [0075]), prior to removal at a temperature below Tg.

Appellant further submits the Office Action is inappropriately reading a timeline into the statements of Davis. Appellant interprets the "maintaining," "increasing" or "decreasing" in Davis

only generally refers to a time "after placing the substrate in the mold" (Davis, ¶ [0075]) and cannot be further assumed to also pertain to the much more specific time of when the substrate is actually removed from the mold. Appellant submits one of ordinary skill in the art would understand a temperature might be maintained until a substrate is to be removed because the only statements where Davis is specific to the temperature at removal describe the substrate to be below the glass transition temperature (Davis abstract, ¶¶ [0011], [0012], [0075] and [0076]). In view of this teaching, the "maintaining" is properly interpreted in view the disclosed need to remove the substrate at below Tg for pattern fidelity reasons.

Appellant understands Davis paragraphs [0076]-[0078] to disclose how separately heating the substrate to above Tg avoids heating the mold above Tg, thereby providing a reduced cycle time. Thus, in this context too "maintaining" appears to refer to having the mold near Tg so that the mold either doesn't need any cooling/heating time or can be more quickly cooled to below the glass transition temperature prior to removal from the mold, as described in Davis paragraph [0075].

On this basis, Appellant submits the rejection has improperly cherry-picked alternatives from Davis' generic statements while ignoring Davis' specific statements that one of ordinary skill would rely on to interpret Davis' disclosure and that clearly teach away from the method recited in claim 1. For this reason, Appellant submits the Examiner has employed impermissible hindsight to arrive at a legal conclusion of obviousness.

The Final Office Action further states on p. 12:

> Davis teaches that the particular temperatures of both the mold and resist represent result-effective variables that should be optimized in order to (1) optimize replication, (2) enable substrate release from the mold and (3) maintain the integrity of the surface features. Thus, the temperatures of both the mold and resist represent result effective variables that should be optimized.

Appellant notes a "result-effective variable" is narrowly interpreted to be only that which "achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation." *In re Antonie*, 559 F.2d 618, 195 USPQ 6 (CCPA 1977) (emphasis added).

While Appellant has already noted that Davis is replete with statements that the temperature of the substrate is to be below the glass transition temperature prior to removal from the mold (Davis abstract, ¶¶ [0011], [0012], [0075], [0076]), Appellant is unable to find any disclosure of

Davis that would relegate doing the exact opposite (i.e. not cooling below Tg prior to removal) simply another value of a result-effective variable. Appellant notes claim 1 is not a situation of merely claiming a narrowed or offset range from that of a reference, but rather doing the opposite of what is specifically disclosed (separating from the mold while resist is above Tg).

Appellant is of the position the final rejection merely recites statements in Davis that are tantamount to saying "anything can be done to the substrate temperature after being placed in the mold of any temperature… as necessary to enable substrate release from the mold" as justification for deeming such temperatures obvious as result-effective variables. Appellant instead submits such uninformative, generic statements are insufficient to justify discounting a claim element as merely a "result-effective variable."

2) Supplemental Declaration is Evidence of Unexpected Result

A supplements declaration was filed under 37 C.F.R. §1.132 as secondary evidence of non-obviousness of claim 1 against the assertion made in the Final Office Action that claim 1 is a *prima facie* obvious over Davis.

Appellant disagrees with the Office Action's assertion that the nexus requirement is not met. Specifically, the Final Office Action p. 19 asserts, "claim 1 does not require that the resist replicate the surface features of the stamper. Thus, replication of surface features cannot be relied upon as an unexpected result." Appellant submits it does not logically follow that a declaration of an unexpected result fails a nexus requirement merely because a claim does not explicitly recite the unexpected result. Rather, Appellant submits the nexus requirement is satisfied because claim 1 recites what led to the unexpected result. Appellant further notes, the instant application clearly teaches a nano-imprint method to address failures in stamped pattern fidelity of the prior art (p. 3, line 9 – p. 4, line 4) and what was unexpected was that the recited method provided good fidelity.

Appellant further submits the experiments undertaken by Appellant were merely set forth in the supplemental declaration and the fact some worked better than others is not a basis for the Examiner to infer that stamper removal temperature was "critical" (Final Office Action p. 19) when the declaration clearly states:

> It was a total surprise that there existed <u>any</u> temperature above the glass transition temperature at which good embossing and separation occurred without incurring reflow upon opening the mold before cooling to below the glass transition temperature. (Treves supplemental declaration, pg. 3, *emphasis added*)

As such, Appellant is of the position that the declaration submitted herewith meets the

nexus requirements outlined in MPEP 716.01(b). On this basis, Appellant submits the declaration serves as objective evidence of non-obviousness which carries substantial weight under *Ashland Oil, Inc. v. Delta Resins & Refractories, Inc.* 776 F.2d 281, 305 (Fed. Cir. 1985).

For these reasons, Appellant requests the Board to reverse to reverse the 35 U.S.C. §103(a) rejection of claim 1 based on Davis. Appellant further requests the Board to reverse the rejection of claims 2, 8, 11, 12, 18, 22 and 25 as claims dependent upon claim 1.

C. References Cited in Dependent Claim Rejections Fail to Cure Deficiencies of the Primary References.

Appellant requests the Board to reverse the 35 U.S.C. §103(a) rejections of the dependent claims enumerated in §VI of this brief on the basis that none of the additional references cited in the rejections C. 1) through C. 14) cure the deficiencies noted with respect to the primary references.

CLAIM REJECTIONS UNDER 35 U.S.C. § 112

A. Claim 25 is based on a disclosure which is enabling

The Final Office Action rejected claim 25 under 35 U.S.C. §112, first paragraph, as not enabling because "the temperature range which produces trench and plateau patterns approximately equal to the surface area of the stamper is critical or essential to the practice of the invention but is not included in the claim."

Appellant submits claim 25 merely more particularly and distinctly claims the "flat" nano-imprint lithography method described throughout the instant application and as claimed in claim 1. Specifically, claim 25 recites an area of the resist film approximately equal to the surface area of the stamper is patterned substantially simultaneously. Appellant submits paragraph [0038]; p. 13, lines 2-3; Fig. 1B (90), particularly given the context of the prior art provided in paragraph [0008], conveys to one of ordinary skill in the art that an area of the resist approximately equal to that the flat stamper recited in claim 1 is to be stamped substantially simultaneously (i.e., roller stamps, such as disclosed in Tan, are further excluded by the language of claim 25). Therefore, Appellant submits claim 25 is fully enabled to one of ordinary skill and requests the Board to reverse the 35 U.S.C. §112, first paragraph rejection of claim 25.

In conclusion, Appellant respectfully submits that all appealed claims in this application are patentable and requests that the Board of Patent Appeals and Interferences reverse the Examiner and direct allowance of the rejected claims.

This brief is submitted with payment in the amount of $540.00 for the appeal fee as specified in 37 C.F.R. §1.17(c). Please charge any shortages and credit any overcharges to our Deposit Account No. 02-2666.

Respectfully submitted,
BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN, LLP

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VIII. CLAIMS APPENDIX

1. A method, comprising:

heating a stamper and a resist film, wherein the stamper is flat;

imprinting the stamper into the resist film;

separating the stamper from the resist film before the resist film is cooled below approximately a glass transition temperature of the resist film; and

cooling the resist film below the glass transition temperature after the separating.

2. The method of claim 1, wherein the stamper and the resist film are heated to a temperature at least that of the glass transition temperature of the resist film.

3. The method of claim 1, wherein imprinting the stamper into the resist film comprises imprinting the stamper into the resist film to produce a pattern of trenches areas and plateau areas.

4. The method of claim 1, further comprising disposing the resist film above a base structure prior to the heating, wherein the base structure comprises a substrate.

5. The method of claim 4, further comprising selectively removing the resist film to form a pattern of areas above the base structure that do not have the resist film thereon.

6. The method of claim 5, further comprising disposing a magnetic layer above the base structure in the areas that do not have the resist film.

7. The method of claim 5, further comprising etching the base structure using the patterned resist film.

8. The method of claim 1, wherein the resist film comprises a single resist layer.

9. The method of claim 1, wherein the resist film comprises a plurality of resist layers.

10. The method of claim 2, further comprising preheating the resist film to the temperature before heating the stamper.

11. The method of claim 1, wherein heating the stamper and the resist film comprises separately heating the stamper and the resist film.

12. The method of claim 11, wherein the stamper and the resist film are separately heated to an imprint temperature at least that of the glass transition temperature of the resist film.

13. The method of claim 12, further comprising placing the resist film in close proximity to the stamper while the resist film is approximately at the imprint temperature.

14. The method of claim 11, wherein the stamper is heated to a first temperature at least that of the glass transition temperature of the resist film and wherein the resist film is separately heated to a second temperature below that of the first temperature.

15. The method of claim 14, further comprising further heating the resist film to the first temperature.

16. The method of claim 11, wherein the stamper is heated to a first temperature at least that of the glass transition temperature of the resist film and wherein the resist film is separately heated to a second temperature above that of the first temperature.

17. (Canceled)

18. The method of claim 1, further comprising disposing the resist film above a base structure prior to the heating, wherein the base structure comprises a substrate.

19. The method of claim 1, further comprising:

selectively etching the resist film to form a pattern of areas above the base structure that do not have the resist film thereon; and

disposing a magnetic layer above the base structure in the areas that do not have the resist film.

20. (Canceled)

21. (Canceled)

22. The method of claim 1, wherein the resist film comprises a thermosetting material.

23. The method of claim 7, further comprising removing the resist film, wherein a pattern of raised zones and recessed zones is formed in the base structure and wherein the method further comprising depositing a continuous film on the pattern of raised zones and recessed zones.

24. The method of claim 23, wherein the resist film comprises a thermosetting material.

25. The method of claim 1, wherein imprinting the stamper into the resist film comprises imprinting the stamper into the resist film to simultaneously produce a pattern of trench areas and plateau areas over an area of the resist film approximately equal the surface area of the stamper.

IX. EVIDENCE APPENDIX

Supplemental Declaration of David Treves filed under 37 C.F.R. § 1.132 on October 31, 2008, a copy of which is filed herewith.

Attorney Docket No. 004085.P030X Patent

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Application of:	)	
	)	Examiner: M. Daniels.
Christopher Bajorek, et al.	)	
	)	
Application No.: 10/659,006	)	Art Group: 1732
	)	
Filed: September 9, 2003	)	
	)	
For: Isothermal Imprinting	)	
	)	

Commissioner for Patents
PO Box 1450
Alexandria, Virginia 22313-1450

SUPPLEMENTAL DECLARATION OF DAVID TREVES
UNDER 37 C.F.R. § 1.132

I, David Treves, hereby declare and say as follows:

I earned my B.Sc. degree in electrical engineering, Summa cum Laude, at the Technion, Israel Institute of Technology, in 1953. I earned an Ingenieur degree in electrical engineering at the Technion in 1954. I earned an M.Sc. degree in electrical engineering in 1956 at the Technion and a D.Sc. degree in electrical engineering in 1958 at the Technion.

For the last fifty years I have worked in a number of research departments in the fields of electrical engineering and physics. Attached as Exhibit A is my curriculum vitae, listing my publications and previous positions. Although listed in Exhibit A, I mention here that I have served on the technical staff at Bell Telephone Laboratories, I was a fellow at IBM, I was a professor of Electronics at the Weizmann Institute of Science, and I worked as a scientist at the Xerox Palo

Alto Research Center. I am currently an IEEE Life Fellow and a WD Fellow at WDC., the assignee of the present application.

I have published more than125 technical papers and 23 U.S. patents have been issued to me.

I have extensive experience in the field of magnetic recording disks and, also, in the manufacture of magnetic recording disks using embossing techniques. As such, I believe I am familiar with the prior art relating to the present invention and am familiar with the knowledge of one of ordinary skill in the art relating to the invention. I also understand the present invention.

The Examiner rejected claims 1, 2, 8, 10-12, 17, 20 and 22 under 35 U.S.C. §102(b) as being anticipated by U.S. Patent Publication No. 20020025408 of Davis ("Davis"). I understand that the Davis discloses:

> Once the substrate has attained the desired temperature, it is placed in the mold and pressure is applied. After placing the substrate in the mold the temperature thereof can be maintained, increased or decreased as necessary in order to optimize replication and enable substrate release from the mold while maintaining the integrity of the surface features. Typically in order to maintain the integrity of the surface features, the molded substrate is cooled to below the glass transition temperature prior to removal from the mold. (Davis, paragraph 0075)

For nano-imprint lithography, the polymer to be imprinted is heated above the glass transition temperature in order to make it soft enough for imprinting without the need to apply exorbitant pressure that would ruin the molding stamper.

In the cases described in prior art, the mold was cooled below the glass transition temperature after imprinting and prior to opening the mold, in order to have the polymer solidified enough to avoid reflow and altering the imprinted features. In the early stages of our research, we found that this procedure worked

reasonably well for large features. However, for small features, below a few tenths of a micrometer, there invariably appeared a severe distortion of the features. The distortion seemed to be a shearing in the radial direction.

We unexpectedly found that if we selected the embossing temperature slightly above the glass transition temperature of the polymer, the shearing distortion disappeared if we did not cool the mold before opening it. For example, for a polymer with a glass transition temperature of 115 degrees C, (Micro Resist Technology mr-I8030E), embossing and opening the mold at 128 degrees C resulted in excellent reproduction as shown in the attached figure; the left side of the figure is a scanning electron micrograph of the stamper used. The right side of the figure is an AFM of the imprint on the polymer. The width of the features here is about 0.055 micrometer. The polymer was coated on a magnetic recording disk using an Aluminum substrate and the stamper was made of Nickel. The molding time to obtain good replication was as short as 5 seconds. The range of embossing temperature at which the mold was opened that gave good results was between 126 and 130 degrees C, well above the glass transition temperature of 115 degrees C. Higher temperature caused reflow on opening the mold, while lower temperature resulted in poor replication.

It was a total surprise that there existed any temperature above the glass transition temperature at which good embossing and separation occurred without incurring reflow upon opening the mold before cooling to below the glass transition temperature.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or

imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Dated: Oct 29, 2008 David Treves

David Treves
WD Fellow
WDC

XI. RELATED PROCEEDINGS APPENDIX

None.